

# 4 cosmic phenomena have the speed of traveling through the speed of light

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The speed of light in a vacuum is equal to 299,792.458m / s. Physicists have found four cosmic phenomena that can reach a state faster than light but still follow the laws of the universe that are Cherenkov radiation, the inflation of the universe immediately after the Big Bang. , entangled quantum and deep hole.

1. The strange energy beam moves faster than the speed of light, moving in a spiral form
2. Learn about black holes, white holes and deep holes

The laws of the universe posed by special relativity give us a better insight into the strange behavior of light in the field of quantum and do not reject Einstein's theory.

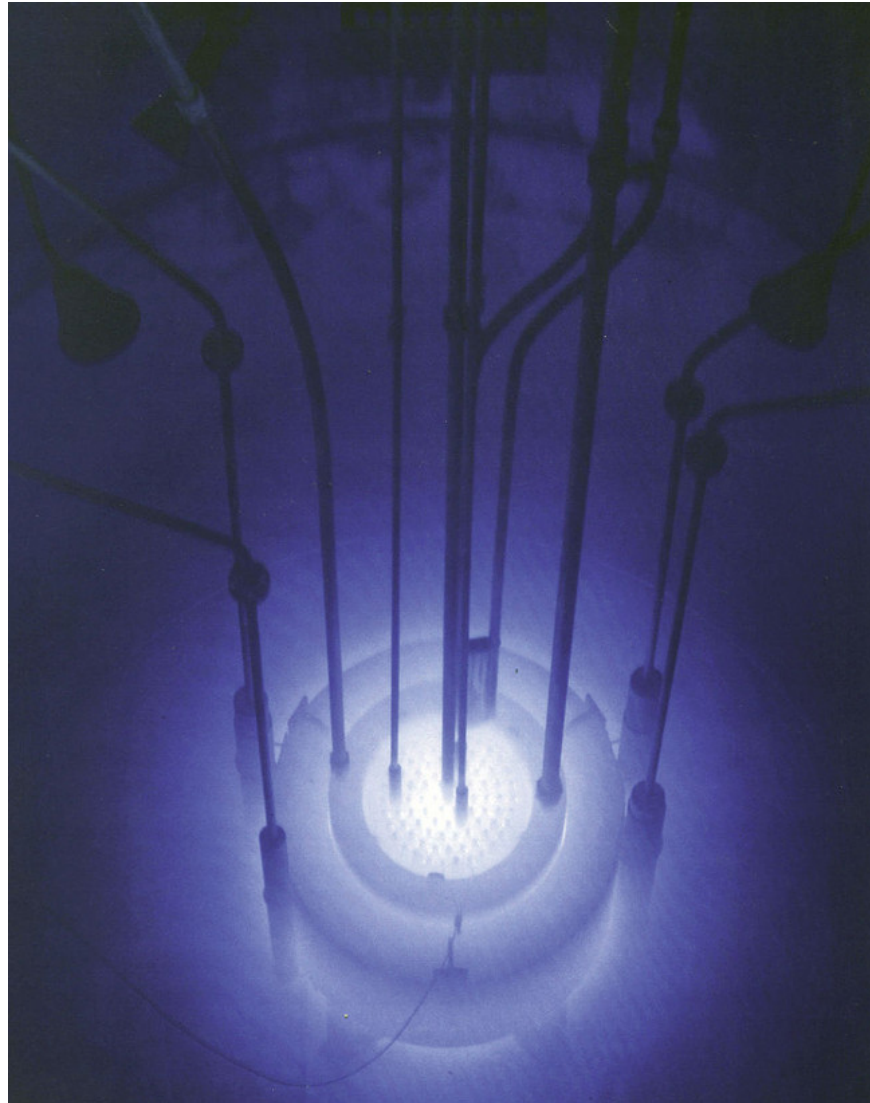
In 1905, Einstein introduced the famous equation  $E = mc^2$  , indicating the relationship between energy and mass. According to this equation, no object with mass can move faster than light.

Although using the LHC particle accelerator to accelerate subatomic particles like electrons, protons, neutrons . but they can only travel at a rate of 99% of the speed of light only. The only particle moving at the speed of light is the photon but it has no mass.

However, physicists have found phenomena that can reach a state faster than light without going against the laws of the universe.

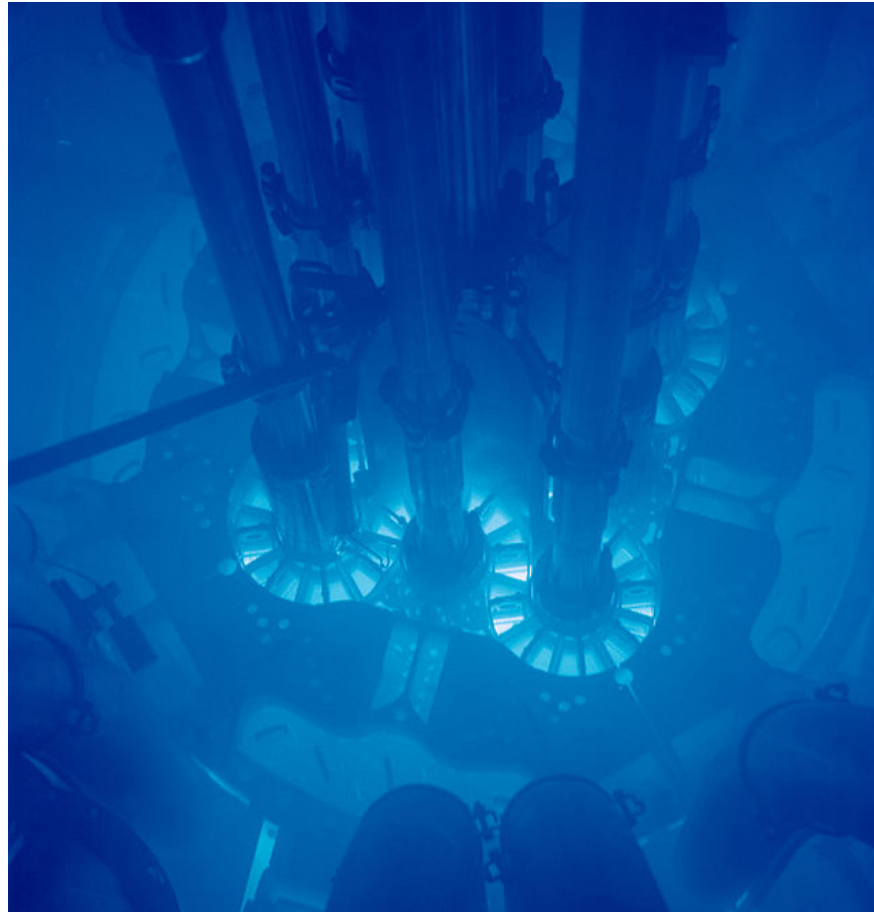
## Cherenkov radiation

An object moving faster than sound will produce ultrasonic explosions. According to that theory, if something moves faster than light, a "light bomb" will be created.



Cherenkov radiation in the Reed reactor.

These light bombs, called Cherenkov radiation, are blue light in nuclear reactors that still occur daily and can be observed with the naked eye. This radiation was named after Soviet scientist Pavel Alekseyevich Cherenkov, who first measured it in 1934. In 1958, he won the Nobel Prize in physics with this discovery.



Cherenkov radiation in a nuclear reactor.(Photo: Argonne National Laboratory).

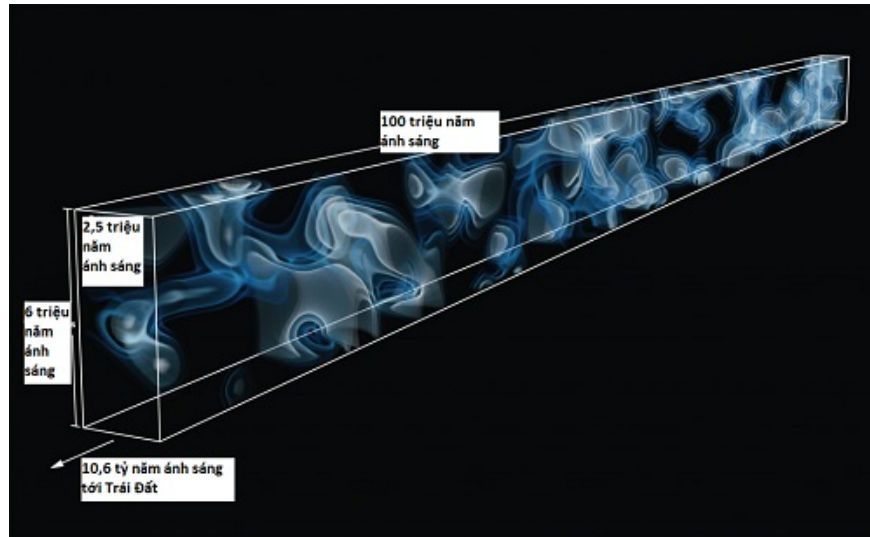
When the core of the reactor is submerged in water for cooling, Cherenkov radiates. The speed of light in water is only 75% of the speed of outside vacuum. Therefore, in water environments the electrons generated from the reaction in the furnace will move faster than light. This process generates shock waves of blue light, or sometimes ultraviolet rays that the naked eye cannot see, like an ultrasound plane.

But in this case, the speed of electrons is only faster than the speed of light in the water, not really reaching the speed of 299,792,458 m / s.

## **Inflation after the Big Bang**

According to physicists, the vacuum absolutely does not contain matter, so it can also be considered a "mass" object.

Michio Kaku, an astrophysicist, said, "Because there is no material inside, the vacuum can expand faster than the speed of light."



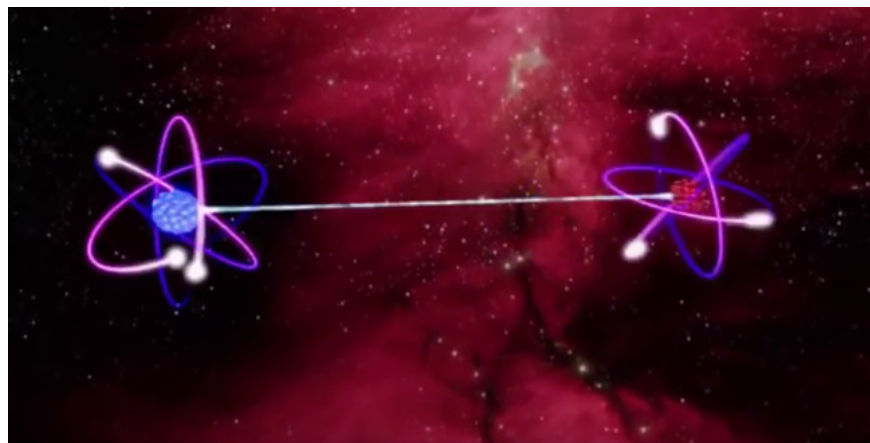
3D images of the universe at a distance of 10.8 billion light-years from Earth.(Photo: Casey Stark (UC Berkeley) / Khee-Gan Lee (MPIA)).

In 1980, physicists Alan Guth and Andrei Linde hypothesized that this phenomenon occurred shortly after the Big Bang, in the process called inflation. In one billionth of a first second, the universe doubled in size, causing the outer boundary to expand extremely fast, even surpassing the speed of light.

## Quantum entanglement phenomenon

At the original level, this phenomenon is how subatomic particles interact with each other.

According to physicist Kaku, " According to quantum theory, if there are two electrons placed close to each other, they can vibrate in the same state. If separated from each other, hundreds or even thousands of light years, they still If an electron oscillates then the remaining electron will "touch" this oscillation immediately, faster than the speed of light. Einstein himself is difficult to accept because of his speed. light level must be the largest ".



Artwork of quantum entanglement phenomenon.(Photo: YouTube / Stargazer).

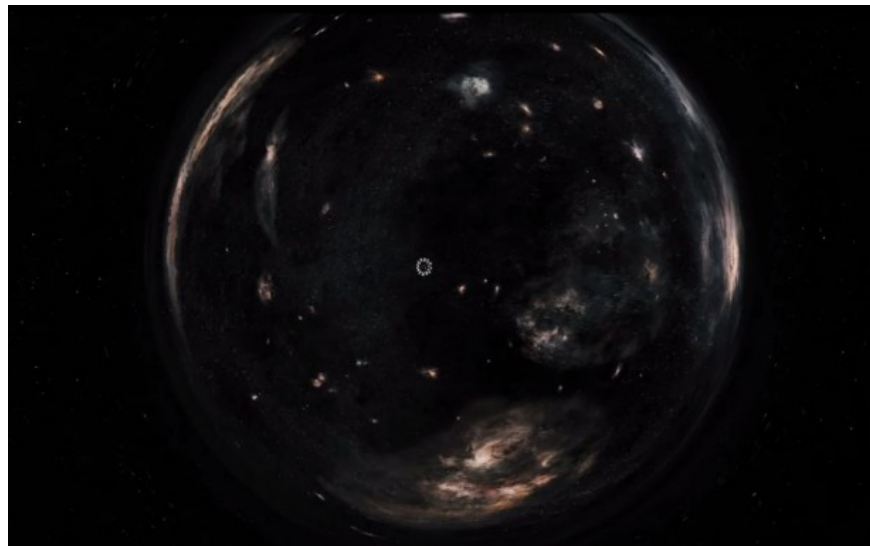
In 1935, Einstein and his two colleagues, Boris Podolsky and Nathan Rosen, tried to reject quantum theory. They co-wrote a famous report entitled "description of quantum mechanics into the physical realm is incomplete", giving arguments that point to quantum entanglement as a paradox (today is called EPR paradox, according to three people name) and cannot happen.

Today, quantum entanglement is an effect applied in some of the world's most advanced technologies such as quantum cryptography, quantum teleportation, and quantum computing.

## Deep hole

The theory of relativity is bound to bind energy to mass, but Einstein offers a general theory of relativity that shows that space and time can be "close" to each other, leading to hope for interstellar travel.

According to Kaku, spacetime bending is the only feasible way to break the light barrier. That bend is "deep hole". According to the deep hole theory will allow something to cross a huge distance immediately, this means that the speed limit of the universe will be broken.



Illustrative images of deep holes.(Photo: Warner Bros).

In 1988, Kip Thorne, theoretical physicist, used the equations of Einstein's theory of relativity to predict the probability that deep holes could be permanently opened for astronautics. But these deep holes need a strange kind of material, which will not be sucked in as ordinary matter but pushed by gravity, to keep them from being closed.

According to Thorne, thanks to the bizarre nature of this quantum physics, this kind of strange matter really exists.

There have been many studies by physicists to determine if there is enough material in the universe for deep holes but no answers yet.

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